MINISTRY OF EDUCATION AND HIGHER EDUCATION

FORM FOUR EXAMS, 2015

CHEMISTRY

20
15

P/LAND NATIONAL EXAMINATION BOARD

MINISTRY OF EDUCATION AND HIGHER EDUCATION

PUNTLAND NATIONAL EXAMINATIONS BOARD

Code Number

FORM FOUR EXAMINATION 2015
Time 2 hours AND 10 minutes for reading

CHEMISTRY

Instructions to candidates

- Answer all the questions
- This paper consists of 16 printed pages, count it and if any is missing inform your invigilator
- Do not write your **name and roll number** on the exam paper
- Make sure that **student's profile** is attached to the exam paper, if not, inform your invigilator.
- No extra paper is allowed. Rough work can be done on page 2. This will not be marked
- If you make a mistake, **cross out the incorrect** answer and **write your correct answer.**

This exam paper consists of following parts
PART ONE: Multiple choices   10 marks
PART TWO: Structured questions   90 marks

   **TOTAL   100 marks**

_____
For the marker only

Parts	Marks
Part one	
Part two	
Total	**%**

Use this page for rough work. It will <u>NOT</u> be marked.

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PART ONE: MULTIPLE CHOICE QUESTIONS: (10 MARKS)

INSTRUCTION TO THIS SECTION: Circle the most correct answer.

1- The electronic configuration of element **Z** is: $1s^2\ 2s^2\ 2p^6$. The element **Z** belongs to:
   A- An alkali metal
   B- An alkaline earth metal.
   C- Halogens
   D- Noble gas

2- The standard test for oxygen gas is:
   A- It turns from colourless to white
   B- A glowing splint bursts into a flame
   C- A glowing splint is extinguished
   D- A glowing splint turns black.

3- How many moles of sodium hydroxide are in 25 cm^3 of 0.40 M of its solution?
   A- 0.01   B- 0.02   C- 0.10   D- 0.15

4- Which of the set of elements have the same outermost electron configuration?
   A- H, He, Be.
   B- H, Li, Be
   C- H, Li, Na
   D- He, Ne, Ar.

5- Which of the following substance is a polar covalent molecule?
   A- Water   B.   Oxygen   C.   Sodium chloride   D   Hydrogen

6- Metals react with dilute acids to produce :
   A- Oxygen gas
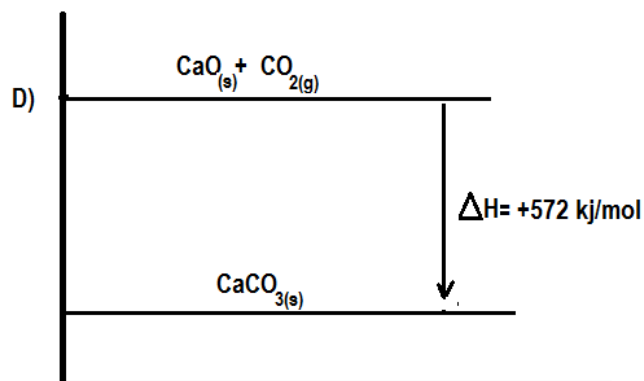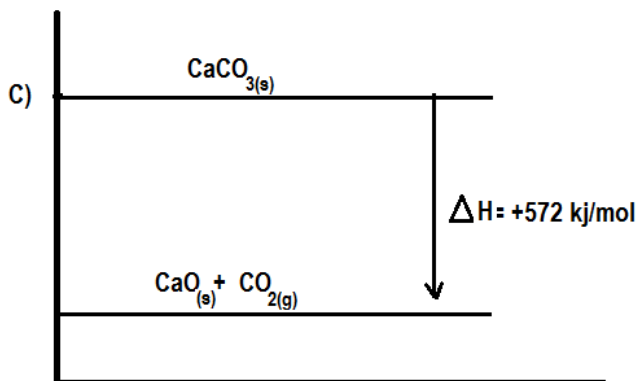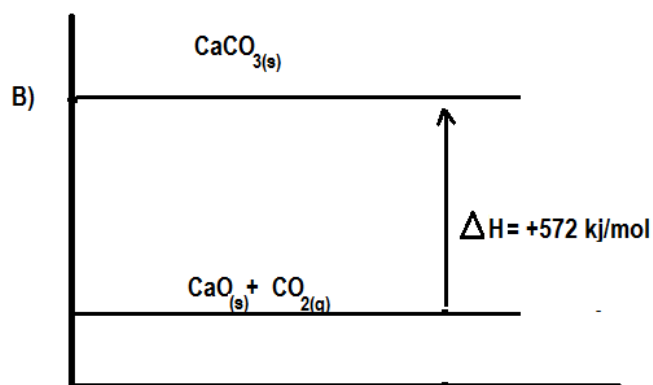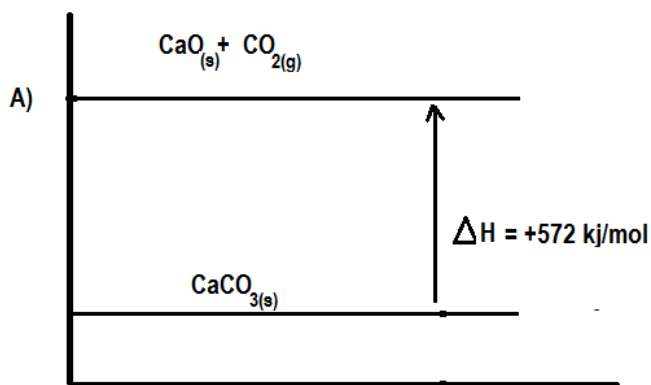   B- Hydrogen gas
   C- Nitrogen gas
   D- Carbon dioxide gas
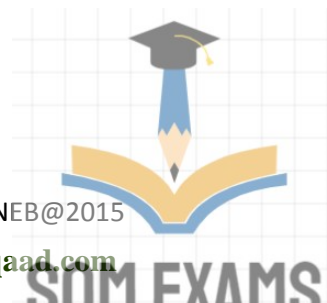
7- Dilute hydrochloric acid is added to limestone chips as shown in the diagram below. Why does the balance reading decrease as the reaction takes place.

A- The reaction is exothermic

B- The reaction produces a gas

C- The marble dissolves in the acid

D- The cotton wool acts as a filter
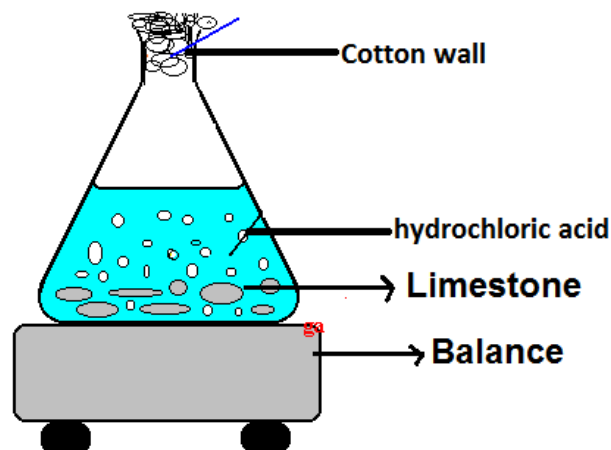
8- Which diagram (shown below) represents the enthalpy profile for the decomposition of calcium carbonate?

A) $CaO_{(s)} + CO_{2(g)}$ ... $CaCO_{3(s)}$ ... $\Delta H = +572\ kj/mol$

B) $CaCO_{3(s)}$ ... $CaO_{(s)} + CO_{2(g)}$ ... $\Delta H = +572\ kj/mol$

C) $CaCO_{3(s)}$ ... $CaO_{(s)} + CO_{2(g)}$ ... $\Delta H = +572\ kj/mol$

D) $CaO_{(s)} + CO_{2(g)}$ ... $CaCO_{3(s)}$ ... $\Delta H = +572\ kj/mol$

9- An organic compound has an empirical formula CH. The molecular mass of the organic compound has been determined to be 26. The molecular formula of the organic compound is:

A- CH $\qquad$ B- C_6H_6 $\qquad$ C- C_2H_2 $\qquad$ D- C_8H_8

10- Non-polar molecules are held together by which of the following forces:

A- Temporary dipole – permanent dipole

B- Ion – ion

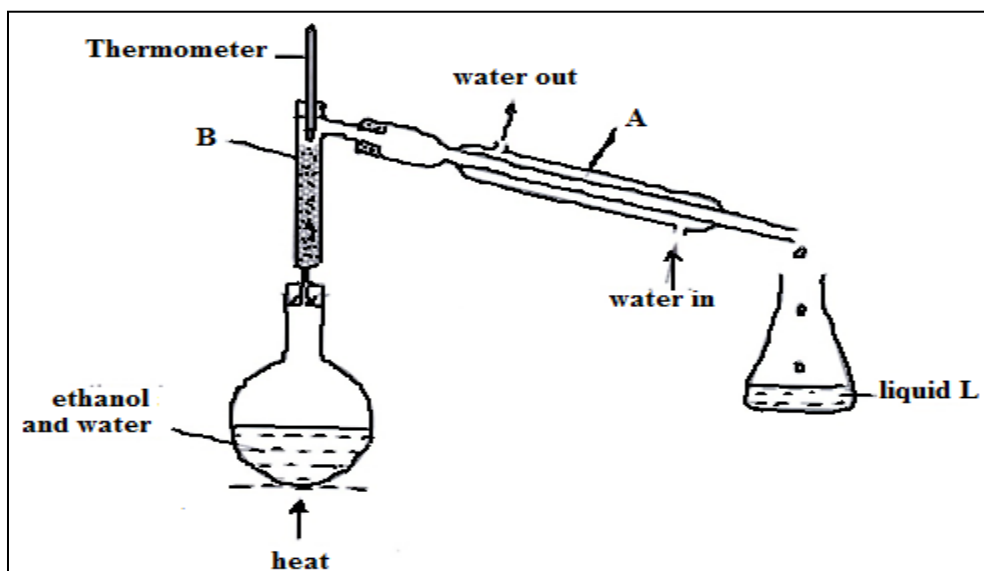C- Temporary induced dipole – temporary induced dipole

D- Permanent dipole – permanent dipole

PART TWO: STRUCTURED QUESTION. (90 marks)

Question one: (13marks)

a) Halima sets up the apparatus below to separate water and ethanol.

i)   Name the apparatus labeled A and B.

A_____

B_____2marks

ii) What is the purpose of apparatus A?

_____1mark

iii) What is the use of the thermometer?

_____1mark

iv) What is the name of liquid **L**?

_____1mark

    b) Classify the following as (atoms, ions, or molecules).   (8marks)

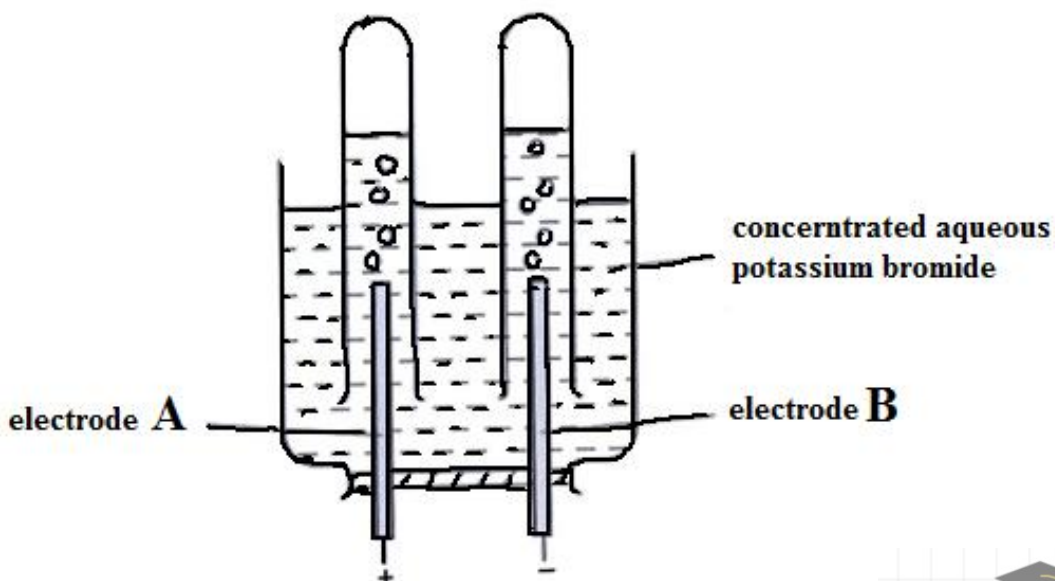 NO_3^- , H_2 , W , He , Fe^{2+} , H_2O , NH_3 , NH_4^+

        Atoms _____

        Ions   _____

        Molecules_____

Question Two: (10 marks).

a) The apparatus below is used to electrolysis the aqueous solution of potassium bromide.

i)   Suggest a suitable substance which could be used for the electrodes.

_____1mark

ii) State the name of the gas given off at the electrode B?

_____1mark

b) Write the reaction that takes place at each electrode when copper sulphate solution

is electrolyzed using :

i)   Graphite electrodes   ii) Copper electrodes.   (4marks)

Electrode	Solution	Reaction takes place at the anode	Reaction takes place at the cathode.
Graphite electrode	Copper sulphate solution		
Copper electrode	Copper sulphate solution		

c) What mass of metallic silver will be deposited when a current of 0.53A is passed

through a silver nitrate solution for 95 minutes? (mass Ag = 108, N = 14, O = 16)

(4marks)
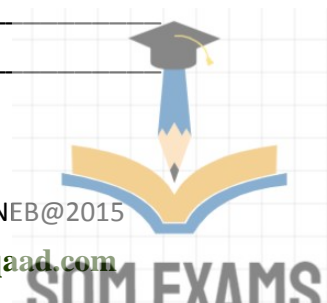
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Question three: (11marks)

a) When Chlorine gas is dissolved in water it forms a solution.

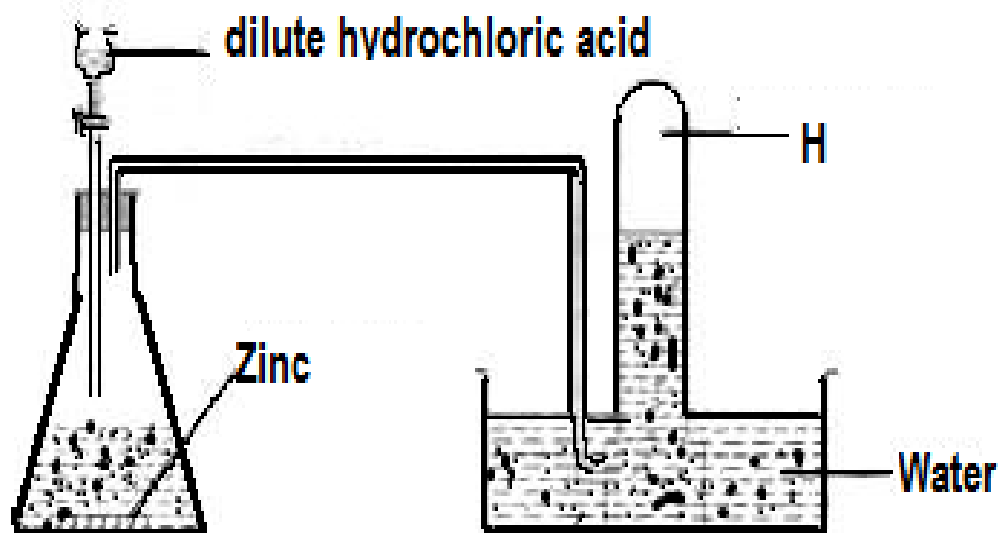   i)   What is the name given to the chlorine solution?

        _____ 1mark

   ii)   Chlorine burns in hydrogen to form hydrogen chloride gas. Write the

        chemical equation for the reaction.

        _____ 1mark

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b) Hydrogen gas can be prepared by reacting Zinc and dilute hydrochloric acid in the apparatus below.

i)   Write the chemical equation for the reaction between Zinc and dilute

hydrochloric acid with state symbols.

_____ 2marks

ii) Explain why potassium cannot be used in the preparation of hydrogen gas?.

_____1mark

iii) Give two properties of hydrogen that make it possible to be collected over

water.

_____

_____2marks

c) The information below is about hydrogen gas. Match the first half of each

sentence with the second half that goes with it.

Note: Take the number and write it in the space between the two sentences.(4mks)

First half of the sentence	Answer	Second half of the sentence
1- Hydrogen is said to be the simplest of all elements.		A- ---- It burns with squeaky pop
2- Hydrogen is flammable ----		B- Because its atoms are made up of only one proton and one electron
3- You can tests for hydrogen using the fact that -----		C- ---- Two hydrogen atoms and one oxygen atoms.
4- Water molecules are composed of -----		D- ---- It burns easily.

Question four: (10 marks)

a) The rate of a reaction between magnesium and dilute hydrochloric acid could be measured using this apparatus.

gas syringe

dilute sulfuric acid

magnesium ribbon
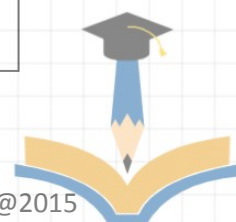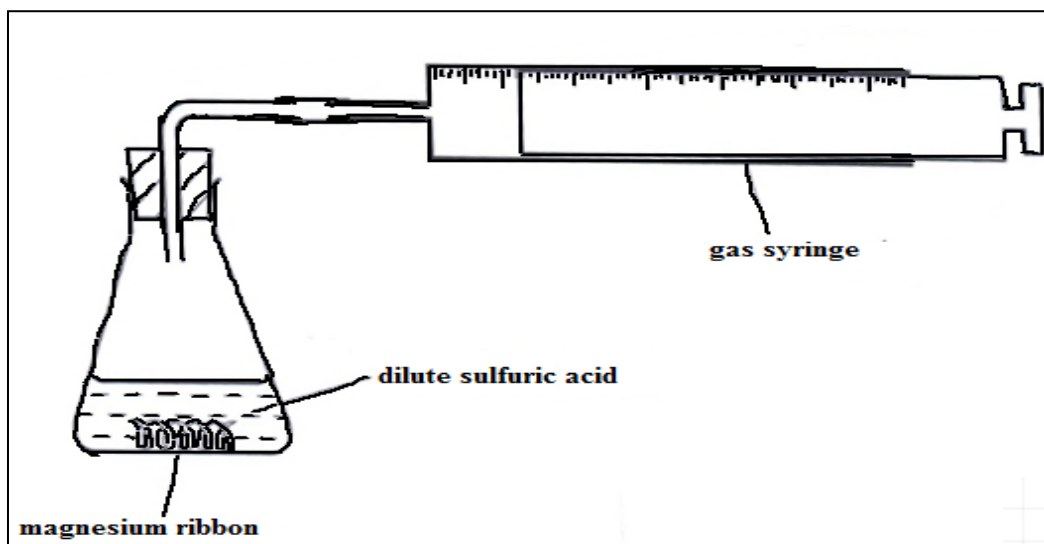
i)   What is the purpose of the syringe?

_____1mark

ii)   What is the purpose of the test tube?

_____ 1mark

iii)   Name the gas that is produced during the reaction.

_____ 1mark

b) Volume of the gas produced was recorded every minute, as shown in the table below.

Time/minute	0	1	2	3	4	5	6	7
Volume of gas produced	0	14	23	31	38	40	40	40

i)   How much gas was produced in the:
   I.   In the first minute _____   1mark

   II- in the second minute _____   1mark

   III)- In the third minute _____   1mark

ii)   What is the total volume of the gas produced at the end of the reaction?

_____ _   1mark

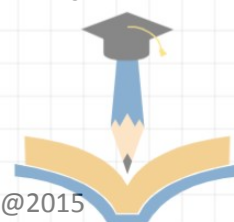iii)   How many minutes does it take the reaction to last?

_____   1mark

Iv)   What is the average rate of the reaction?

_____   1mark

v) What is the rate of the first minute of the reaction?

_____   1mark

Question five: (11marks)

a) Complete the following paragraph by using the words below.   (9marks)

--ene	methane	one	C_2H_6	Twice
--ane	propene	CH_4	Propane	

The names of alkanes ends in -----------------. The names of alkenes end in ---------------

An example of an alkane is -------------------------- and an example of an alkene is

------------------------------. ------------------------------- is the most basic alkane because it

has only -------------------------- carbon atom. The chemical formula for methane is

--------------------------------------. The chemical formula for ethane is _____.

In alkanes, the number of hydrogen atoms is -------------------------------- the number
of carbon atoms plus two.

b) How many hydrogen atoms are in an alkane with 4 carbon atoms?

_____1mark

c) Which is more reactive alkane or alkene? _____(1mark)

Question six: (12marks)

a)   How many electrons was fit into each of an **S** sub shell, **P** sub shell, **d** sub shell

   and a **f** sub shell

i)   **s** sub shell _____ 1mark

ii)   **p** sub shell _____ 1mark

iii)   **d** sub shell _____ 1mark

iv)   **f** sub shell _____ 1mark

b) The table below shows some electronic configuration of atoms and ions.
Complete the missing ones.   (8marks)

	Sodium atom	Sodium ion	Fluoride atom	Fluoride ion
Symbol		Na$^+$	F	
Atomic number		11		9
Electrons	11		9	
Electronic Configuration	1s^2 2s^2 2p^6 3s^1			1s^2 2s^2 2p^6

Question seven: (11marks)

a) Energy changes during reactions can be considered several different enthalpy changes. The table below shows the values of some average bond enthalpies.

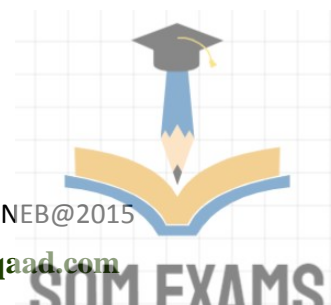| Bond	Average bond enthalpy kj/mol
C – H	+ 410
O – H	+465
O = O	+500
C = O	+805

a) Define these terms:

i) Enthalpy _____

_____1mark

ii) Bond enthalpy_____

_____1mark

b) Use the average bond enthalpies from the table to calculate the enthalpy change

of combustion of gaseous methane (ΔH_c).   3marks

Bonds breaking   bonds forming

4 x C-H and 2 x O=O   2 x C = O and 4 x H - O

_____

_____

_____

_____

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_____

c) Draw the enthalpy profile for the enthalpy change of combustion of methane.

(2marks)

_____

_____

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_____

d) Which of the following reaction are endothermic and which are exothermic?

Combustion, decomposition of limestone, neutralization, ammonium chloride with water.   (4mrks)
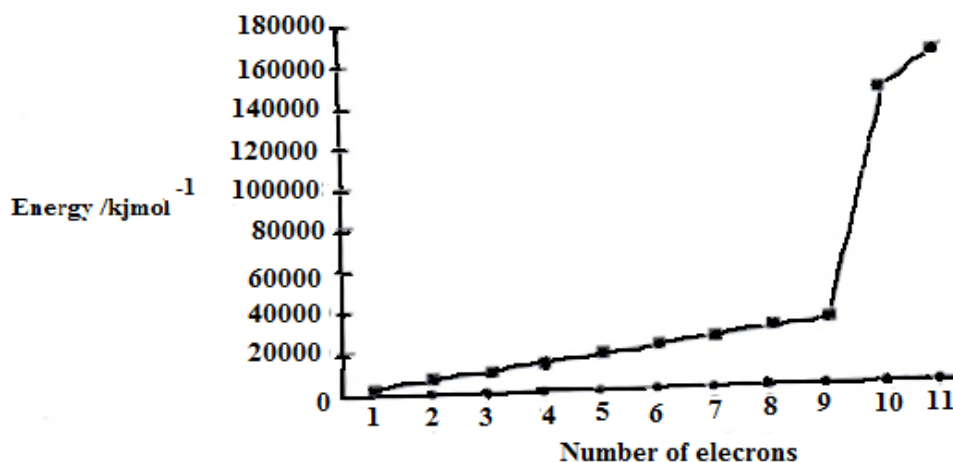
Exothermic_____

Endothermic_____

Question eight: (12)

a) There are eleven electrons in a sodium atom. The amount of energy required to remove each electron have been measured and results shown on the graph below.

i)   Define the term first ionization energy?

_____

_____ 1mark

ii)   Why the first electron in sodium is easy to remove?

_____

_____ 1mark

iii)   The second ionization energy of sodium is 4650KJ/mol. Write an equation including state symbols, to represent the second ionization energy of sodium.

_____

_____2marks

b) List three factors that strongly influence ionization energy.   3marks

_____

_____

_____

c) Carbon dioxide, Nitrogen and oxygen molecules are all gases at their physical states at room temperature and pressure.

   i)   Which of the three molecules has one double bond?

   _____ 1mark

   ii)   Which of the following molecules has two double bonds?

   _____ 1mark

   iii) Which of the following molecules has one triple bond?

   _____ 1mark

   d) Draw dot and cross diagram for carbon dioxide molecule?   2marks

_____

_____

_____

END